

BENEFICIAL USE CRITERIA

This portion of appendix E explains the methods the Montana Department of Environmental Quality (DEQ) used to develop beneficial use criteria for Tier 1 of the risk-based corrective action (RBCA) process.

Data sources are provided and a reference list is provided at the end of the appendix.

Groundwater Criteria

The Massachusetts Department of Environmental Protection (MADEP) recommends that a cap of 1 milligram per liter (mg/l) be applied to C19-C36 aliphatics. Due its low solubility, values in excess of 1 mg/l may be indicative of non-dissolved conditions. Aliphatic compounds greater than C12 are essentially insoluble (i.e., saturation levels less than 1 microgram per liter ($\mu\text{g/l}$)) and the calculated solubility for C9-C12 aliphatics fraction is 0.07 mg/l (MADEP, 1996). DEQ recommends that a ceiling of 1 mg/l be applied to the C9-C12, C9-C18, and C19-C36 aliphatic fractions based upon their low solubility and that values in excess of 1 mg/l may be indicative of non-dissolved conditions.

Soil Ceiling Limits

Although it is not possible to determine an Odor Index for the various aliphatic and aromatic ranges, ceiling values could be determined on the basis of the average vapor pressures within the various VPH/EPH fraction. Based upon an evaluation conducted by the Total Petroleum Hydrocarbon Criteria Working Group (TPHCWG), a compound's vapor pressure is directly related to its Relative Carbon Number Index (RCNI), regardless of whether that compound is an aliphatic or aromatic hydrocarbon (MADEP, 1996).

Using the TPHCWG defined mathematical relationship for vapor pressure, MADEP proposed a ceiling concentration in soil based on the odor index of the fraction and the volatility of the fraction based on the calculated vapor pressure. The resulting soil cap for the defined volatile fractions (i.e., C5-C8 aliphatics, C9-C12 aliphatics, and C9-C10 aromatics) was 100 milligrams per kilogram (mg/kg) for residential soil. For commercial/industrial and construction soils classifications, Massachusetts recommends using cap of 500 mg/kg.

For the non-volatile fractions, (i.e., C9-C18 aliphatics, C19-C36 aliphatics, and C10-C22 aromatics) each hydrocarbon range was proposed to be capped at 1000 mg/kg residential, except for the C19-C36 aliphatic range which was proposed to be capped at 2500 mg/kg for residential soils due to this fraction being relatively insoluble, immobile, and non-volatile (ADEC, 1996). For commercial/industrial and construction soils classifications, MADEP recommends using 2500 mg/kg and 5000 mg/kg, respectively, except for the C19-C36 aliphatic range which would have a ceiling of 5000 mg/kg for soils that have been classified as commercial.

DEQ recommends this same approach for each of the six hydrocarbon fractions. The beneficial use ceilings for C9-C12 aliphatics, C9-C18 aliphatics, and C19-C36 aliphatics are well below the calculated risk-based values and soil-to-groundwater leaching values. It is anticipated that cleanup for these fractions will be driven by the beneficial use ceiling values.

References:

Alaska Department of Environmental Conservation, Petroleum Cleanup Guidance, Background on Development of Regulations for Soil and Groundwater Cleanup Levels at Sites Contaminated With Petroleum Products, 1996.

Massachusetts Department of Environmental Protection (MADEP), Implementation of VPH/EPH Approach, 1996.